DOCUMENT RESUME

ED 218 358 TM 820 454

AUTHOR Hartley, James; Trueman, Mark
TITLE Headings in Text: Issues and Data.
INSTITUTION Keele Univ. (Great Britain).
SPONS AGENCY Army Research Inst. for the Behavioral and Social Sciences, London (England). European Research Office.
PUB DATE Mar 82
CONTRACT DAJA37-81-C-0277
NOTE 45p.; Paper presented at the Annual Meeting of the American Educational Research Association (66th, New York, NY, March 19-23, 1982).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Processes; Information Retrieval; Junior High Schools; *Layout (Publications); *Reading Comprehension; *Reading Research; Recall (Psychology); Secondary Education
IDENTIFIERS *Headings

ABSTRACT

A series of studies was conducted to: (1) examine the effects of headings on both recall (a memory task) and retrieval (a search task) from the same text; and (2) distinguish between retrieval from unfamiliar text and retrieval from familiar text. Pupils aged between 14 and 15 years of mixed reading ability took part in six separate studies, each of which partially replicated and partially expanded the previous studies. Preliminary results suggest that headings aid both the recall and retrieval of information from the text. The position of the headings (marginal or embedded) had no effect on the results, but the headings (questions or statements) might have differential effects with learners of different ability (headings enhanced the recall of low-ability subjects). It also appears that headings in the form of questions might be more effective than headings in the form of statements for less able readers. Further experiments in this area are planned. (Author/CM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED218358

Headings in Text : Issues and Data

James Hartley and Mark Trueman

University of Keele, Staffordshire, U.K.

Paper to the AERA Annual Convention, March, 1982, New York.

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Hartley, J.

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

TM 820 454

Abstract

This report describes some of the issues confronting research workers who want to carry out research on the effects of headings in text. An overall strategy of attack is formulated and the results presented from six of nine experiments necessary to complete the first stage of the research. These preliminary results suggest that headings aid both the recall and the retrieval of information from the text used in these experiments. It seems that the position of the headings (marginal or embedded) has no effect on the results, but that the headings (questions or statements) might have differential effects with learners of different ability. (headings enhancing the recall of low-ability participants). It also appears, but this remains to be tested more thoroughly, that headings in the form of questions might be more effective than headings in the form of statements for less able readers.

Key words

headings

text layout

text comprehension

retrieval from text

Introduction

If, as teachers, researchers or writers, we were to ask about the effects of headings in text, a number of issues might be raised. We could for instance, ask questions about:

- the presence of headings versus their absence
- the effects of headings on recall or retrieval (or both)
- the position of headings
- the frequency of headings
- the kinds of headings (e.g. questions vs statements; short vs long)
- the kinds of text in which headings might appear (e.g. high vs low structure; technical vs semi-literary)
- the typographic denotation of different levels of headings
- the effects of headings on immediate and long-term recall
- the effects of age and ability in using headings
- the effects of constructing headings for text we are reading
- and so on.

Unfortunately, if we examined the research literature on these topics, we would find no clear answers to our questions. Panel 1 summarises the research on headings. It is apparent from Panel 1 that:

- over half of the studies are very recent ones
- most of the studies address the topic of the effects of headings on the recall of information after reading the text
- few studies address any other issues.

Some other points, not apparent from Panel 1, are that few investigators have studied more than three of the issues listed above, and no-one has investigated any of them systematically. Indeed, all of the studies cited in Panel 1 (including our own) may be characterised as 'one-off' ones.

So, because of the paucity of experimental studies, no general conclusions can be drawn about the value of headings for instructional text. Different investigators have used different texts, different kinds of headings, different learner samples, and different ways of testing the effectiveness of headings. Consequently no-one is yet in a position to proffer clear guidelines of how headings in text can best be used.

What seems to be required to achieve this is a series of studies, each one of which partially replicates and partly builds upon the previous one(s). We have begun a series of such studies, and it is our intention in this report to present the results from as many studies as we have completed at the time of writing.

Our experiments : an overview

It has been suggested that headings can be used to aid recall (in memory tasks) and to aid retrieval (in search tasks) but no-one to our knowledge has examined the effects of headings

Panel 1. Experiments on headings : a survey of issues and studies
(* indicates a significant result)

1. Effects of headings on recall of information

Robinson and Hall (1941)

Christensen and Stordahl (1955)

* Klare et al (1958)

Cole (1977)

* Doctorow et al (1978)

* Dee-Lucas and DiVesta (1980)

* Hartley et al (1980)

* Hartley et al (1981)

* Holley et al (1981)

Brooks et al (1981)

2. Effects of headings on retrieval from familiar text

Charrow and Reddish (1981)

3. Effects of headings on searching unfamiliar text

* Hartley and Burnhill (1976)

4. Effects of different frequencies of headings

* Klare et al (1958)

5. Effects of different kinds of headings

Christensen and Stordahl (1955)

* Hartley et al (1980)

* Hartley et al (1981)

6. Effects of headings on long term recall

Christensen and Stordahl (1955)

* Hartley et al (1980)
* Hartley et al (1981)
* Holley et al (1981)

7. Effects of headings on readers of different ability

* Klare et al (1958)
* Hartley et al (1980)

8. Effects of instructing readers to use headings

Cole (1977)

Holley et al (1981)

* Brooks et al (1981)

9. Effects of instructing readers to generate headings

* Doctorow et al (1978)
* Dee-Lucas and DiVesta (1980)

Holley et al (1981)

10. Effects of headings on preferences for text

* Klare et al (1958)
* Charrow and Reddish (1981)

11. Effects of the position of headings in text

(no studies)

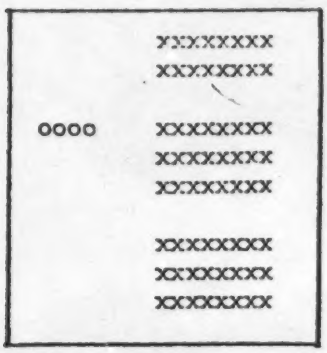
on both recall and retrieval from the same text. Similarly, no-one to our knowledge has distinguished between retrieval from unfamiliar text (i.e. a search task) with searching in familiar text (i.e. a retrieval task). Commentators have suggested that it is easier to retrieve from text that has marginal headings (as opposed to embedded ones), and our own previous research has suggested that headings in the form of questions help less-able readers (e.g. Hartley et al, 1980, 1981). Our experiments thus presently focus on:

- recall and retrieval (from unfamiliar and familiar text);
- the position of headings (marginal vs text embedded); and
- the kind of headings used (questions vs statements).

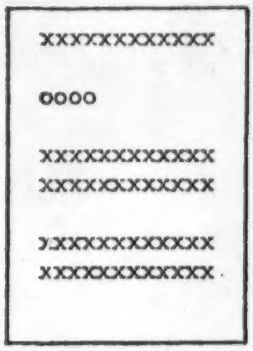
At present we use a four page typescript version of a piece of semi-technical prose as our text material. We intend at a future date to replicate our findings with both more and less technical text, and to investigate the effects of age and ability with these different texts.

Generally speaking, in these experiments the participants are presented with the passages of text in the conditions shown schematically in Figure 1. (The headings may be either in the form of questions, or statements.) The amount of text is held constant on each page, and the only thing that varies is the presence or absence of the headings.

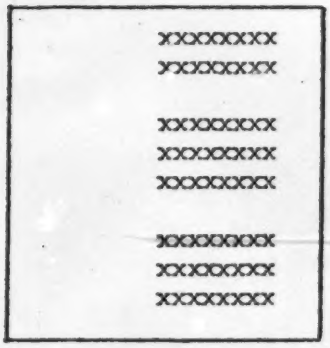
The passage contains approximately one-thousand words and is about television viewing habits in the United Kingdom. It has a Flesch reading ease score of 55, i.e. it is 'fairly difficult'



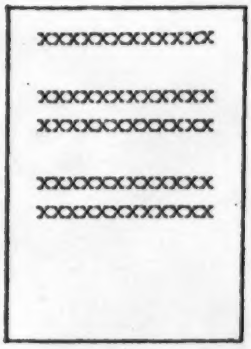
Marginal headings



Text headings



Control for marginal headings
(text width approx. 12cms)



Control for text headings
(text width approx. 16cms)

Figure 1. A schematic representation of the conditions used in the studies reported in this paper.

or suitable for 15-17 year olds. The passage is subdivided into twelve paragraphs, and as a report of a questionnaire, it contains a large number of facts and figures. In the headings conditions there are six headings - approximately one every two paragraphs.

A twelve item short-answer test is attached to the back of each of the four versions of the passage. These test questions do not repeat questions asked in the headings. The text headings indicate structure (e.g. 'How do people react to the BBC?') whereas the test questions are more specific (e.g. 'What percentage of viewers were dissatisfied with BBC 1 programmes?').

Figure 2 illustrates the overall - or master plan - of our current research. Experiments 1 and 2 focus on recall, and Experiments 3 and 4 and 5 and 6 on retrieval. The precise conditions to be used in Experiments 7, 8 and 9 depend upon the outcome of Experiments 1 - 6. So, using the plan of attack described in Figure 2, what have we found? Let us take each experiment in turn.

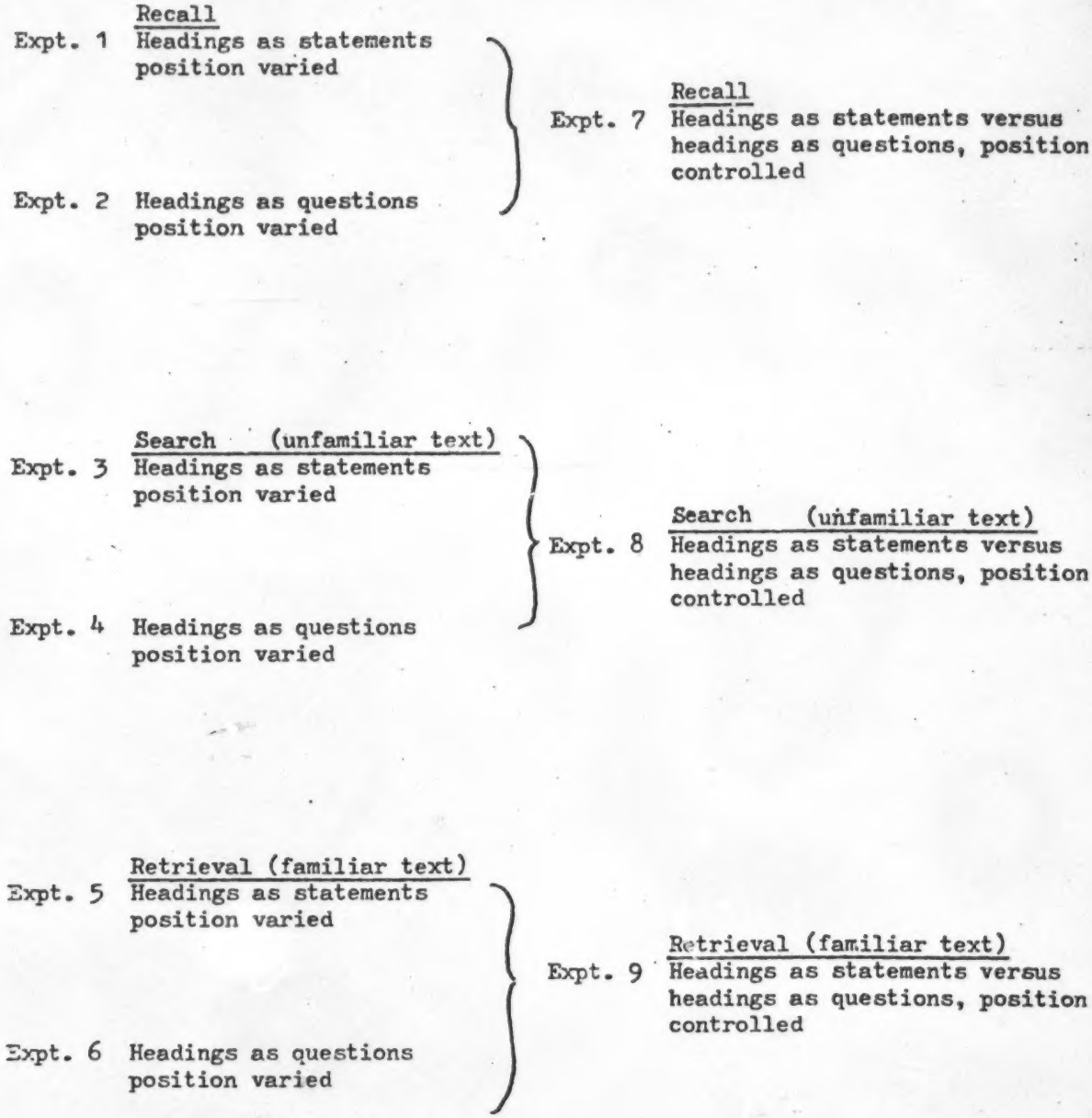

Recall
Expt. 1 Headings as statements position varied
Expt. 2 Headings as questions position varied
Expt. 7 Recall Headings as statements versus headings as questions, position controlled
Search (unfamiliar text)
Expt. 3 Headings as statements position varied
Expt. 4 Headings as questions position varied
Expt. 8 Search (unfamiliar text) Headings as statements versus headings as questions, position controlled
Retrieval (familiar text)
Expt. 5 Headings as statements position varied
Expt. 6 Headings as questions position varied
Expt. 9 Retrieval (familiar text) Headings as statements versus headings as questions, position controlled

Figure 2. A schematic diagram of the research strategy. Experiments 7, 8 and 9 depend upon the outcome of Experiments 1 - 6.

EXPERIMENT ONE

Aims

The aims of Experiment One were (i) to see if headings written in the form of statements improved readers' recall of factual information, and (ii) to see if the position of a heading (embedded in the text or placed in the margin) affected readers' recall of information.

Participants. One hundred and seventy fourth-year comprehensive school pupils (aged between 14 and 15 years) of mixed-ability took part in this enquiry. The pupils were divided by the school into three groups of ability at English - high, middle and low - and were taught in separate sets. Pupils in the remedial section of the English department did not participate.

Procedure

Booklets in each of the four conditions shown in Figure 1 were distributed systematically to the participants in two separate classes by two experimenters on each of two separate days. Each booklet contained a cover sheet, one version of the passage, and a test-sheet on the back.

The participants were asked to read the passage through once carefully, and then when they had completed their reading to turn the booklet over and answer the test questions on the back. They were instructed to leave the answers blank or to guess at the answers to questions they could not complete and to go on to the next question.

In order to reduce the possibility of cheating the participants were told that four ways of presenting the same passage were being compared, and that the experiment was concerned with testing the effectiveness of the different versions. In addition the order of the questions asked on the test-sheet was varied for each of the four conditions.

The experimental procedure used was that of a four groups design with different participants in each group.

Results

The results obtained from this enquiry are shown in Table 1.

Analyses of sub-groups showed:

- no significant position effects for the headings : participants with marginal headings ($\bar{x}$ = 7.6) performed as well as participants with embedded headings ($\bar{x}$ = 7.5);
- no significant differences between the two control passages : participants with the longer line-length ($\bar{x}$ = 6.8) performed as well as participants with the shorter one ($\bar{x}$ = 6.8).

TABLE 1. The results of Experiment 1.
Average recall scores out of 12.
Headings in the form of statements.

		Boys	Girls	Total	Overall
Headings	Text	7.5 (N=23)	7.4 (N=21)	7.5 (N=44)	7.6 (N=86)
	Margin	7.2 (N=23)	8.0 (N=19)	7.6 (N=42)	
Controls	Text	6.3 (N=24)	7.4 (N=18)	6.8 (N=42)	6.8 (N=84)
	Margin	6.6 (N=21)	7.0 (N=21)	6.8 (N=42)	

TABLE 2. The results of Experiment 1 expressed in terms of ability.

		Boys	Girls	Total
High Ability	Headings	9.3 (N=14)	9.5 (N=15)	9.4 (N=29)
	Controls	8.1 (N=12)	8.3 (N=15)	8.2 (N=27)
Middle Ability	Headings	7.3 (N=14)	7.4 (N=16)	7.4 (N=30)
	Controls	6.9 (N=15)	6.8 (N=15)	6.9 (N=30)
Low Ability	Headings	6.0 (N=18)	4.9 (N=9)	5.6 (N=27)
	Controls	5.0 (N=18)	5.8 (N=9)	5.3 (N=27)

Accordingly, it was deemed legitimate to pool the results for the headings groups and for the control groups. When this had been done, a two-way analysis of variance (presence/absence of headings x sex) was carried out. The main results indicated:

- an overall conditions effect: participants with headings ($\bar{x}$ = 7.6) did better than participants without them ($\bar{x}$ = 6.8). (F = 4.554, df 1,166, p = .034);
- no significant sex effects: girls ($\bar{x}$ = 7.4) did better than boys ($\bar{x}$ = 6.9) but this difference was not significant. (F = 2.015), df 1,166, p = .158);
- no significant interactions between these variables. (F = 0.455, df 1,166, p = .501).

In the light of the data on ability obtained by Hartley et al, 1980 (which suggested that low-ability pupils profit more from headings) the data were next examined for each of the ability streams in the English department. The data obtained are shown in Table 2.

A three-way analysis of variance (ability x presence/absence of headings x sex), followed by Scheffé tests when appropriate, showed that:

- high-ability participants ($\bar{x}$ = 8.8) did significantly better than middle-ability ($\bar{x}$ = 7.1) and middle-ability did significantly better than low-ability ($\bar{x}$ = 5.5), (F = 45.94, df 2,158, p $<$ .001);
- no significant sex effects (F = 0.03, df 1,158, p = .856);
- participants with headings did better than participants without them (F = 6.25, df 1,158, p $<$ .02); the gain for headings for the high-ability participants was 12%, for the middle-ability it was 11% and for the low-ability it was 11%. These differences were not significant : that is,

there was no significant interaction between the levels of ability and the presence/absence of headings ($F = 0.830$, df 2,158, $p = .438$).

These results appear to contradict those found by Hartley et al (1980) but, it must be remembered, that the differential effect with ability found in the earlier study lay with headings written in the form of questions and not written in the form of statements (as in this present experiment). Indeed, Hartley et al (1980) found that although headings written in the form of statements helped the recall of their three ability groups, the amount of help was not clearly related to ability.

Conclusions

The results of this experiment indicate a superiority for headings written in the form of statements but they do not indicate any differential effect regarding their position. High-ability participants recalled more than low-ability ones, but there were no significant interactions between ability and the presence or absence of headings. These findings occurred when the headings were written in the form of statements : in Experiment 2 we turn to examine the effects of headings written in the form of questions.

EXPERIMENT TWO

Aims

The aims of Experiment 2 were (i) to see if headings written in the form of questions improved readers' recall of factual information, and (ii) to see if the position of a heading (embedded in the text or placed in the margin) affected readers' recall of information.

Materials

The Passage. The three versions of the passage on television viewing habits were employed in this experiment. They were as follows:

- Headings written in the form of questions, embedded in the text.
- Headings written in the form of questions, placed in the margin.
- A control text, without headings, the same width as the text with marginal headings (approximately 12 cms).

The test. The same twelve short-answer test used in Experiment 1 was also used in this enquiry.

Participants. One hundred and fifty-five fourth-year comprehensive school pupils (aged between 14 and 15 years) of mixed-ability from a different school took part in this enquiry. They were divided by the school into three groups of ability at English - high, middle and low - but taught in mixed-ability groups.

Procedure

The procedure was the same as that used in Experiment 1 except that on this occasion three conditions were compared.

Results

The results obtained from this enquiry are shown in Table 3. Inspection of these data suggested that it would be legitimate to pool the results from the two headings conditions, and to compare them with the control group. When this had been done a two-way analysis of variance (presence/absence of headings x sex) was carried out. The main results indicated:

- an overall conditions effect : participants in the headings conditions ($\bar{x}$ = 6.5) recalled significantly more than participants in the control group ($\bar{x}$ = 5.8). ($F = 6.28$, df 1,151, $p = .013$);
- a significant sex effect : boys ($\bar{x}$ = 6.6) recalled more than girls ($\bar{x}$ = 6.0). ($F = 5.642$, df 1,151, $p = .019$);
- no significant interactions between these variables. ($F = 0.054$, df 1,151, $p = .816$).

The results were next examined in terms of ability data obtainable from the school. The recall scores of the three ability groups (high, middle and low) were calculated. The means obtained are shown in Table 4.

These data were subjected to a three-way analysis of variance (ability x presence/absence of headings x sex) followed by Scheffe' tests when appropriate. The results indicated:

- high-ability participants ($\bar{x}$ = 6.9) did significantly better than middle-ability ($\bar{x}$ = 6.0) and middle-ability did significantly better than low-ability ($\bar{x}$ = 5.5). ($F = 9.223$, df 2,143, $p < .001$);

TABLE 3. The results of Experiment 2.
Average recall scores out of 12.
Headings in the form of questions.

		Boys	Girls	Total	Overall
Headings	Text	6.8 (N=28)	6.4 (N=26)	6.6 (N=54)	6.5 (N=104)
	Margin	6.8 (N=21)	6.1 (N=29)	6.4 (N=50)	
Control	Margin	6.2 (N=22)	5.5 (N=29)	5.8 (N=51)	5.8 (N=51)

TABLE 4. The results of Experiment 2 expressed in terms of ability.

		Boys	Girls	Total
High Ability	Headings	7.2 (N=27)	6.6 (N=21)	6.9 (N=48)
	Control	6.9 (N=8)	6.8 (N=10)	6.8 (N=18)
Middle Ability	Headings	6.9 (N=10)	5.7 (N=18)	6.1 (N=28)
	Control	6.2 (N=6)	5.6 (N=9)	5.8 (N=15)
Low Ability	Headings	5.9 (N=12)	6.3 (N=16)	6.1 (N=28)
	Control	5.4 (N=8)	4.0 (N=10)	4.6 (N=18)

- participants with headings did better than participants without headings in each of the levels of ability (with the exception of high-ability girls). ($F = 4.876$, df 1,143, $p = .029$);
- boys did significantly better than girls in each of the levels of ability (except for low-ability boys in the headings condition). ($F = 4.363$, df 1,143, $p = .039$);
- no significant interactions between these three variables.

The gain for the high-ability participants was 2%, for the middle-ability it was 5% and for the low-ability it was 33%.

Conclusions

The results of this experiment indicate a superiority for headings written in the form of questions, but they do not indicate any differential effect regarding their position. High-ability participants recalled more than low-ability ones but there were no clear interactions between ability and the presence of headings.

There were two main differences between the findings reported for this experiment and those for Experiment 1.

1. In this experiment the overall scores (average $\bar{x} = 6.3$) are lower than those reported in Experiment 1 (average $\bar{x} = 7.2$). It is likely that this result reflects differences between the school populations used.
2. In this experiment the percentage gain for headings written in the form of statements was 2% for high-ability pupils, 5% for middle-ability and 33% for low-ability.
   In Experiment 1 the figures were 12%, 11% and 11% respectively.

Thus this experiment (whilst not producing significant interactions) does seem to support the findings of Hartley et al, 1980 and Hartley et al, 1981 concerning the greater effects of headings written in the form of questions with low-ability participants.

Accordingly, in planning the third experiment in this series we wished to compare directly the effects on recall of headings written in the form of statements with those written in the form of questions. In the light of the results obtained in Experiments 1 and 2, it seemed reasonable to pursue this issue with headings in one position - embedded in the text. However, before we could proceed in this way, we felt it was first necessary to examine the effects of the position of headings on readers' ease of retrieval from the passage.

Retrieval Studies

Some problems

The two previous studies that examined the effectiveness of headings as aids to retrieval (Hartley and Burnhill, 1976; Charrow and Reddish, 1981) both confounded the presence or absence of headings with other typographical and text changes, and therefore cannot be counted as 'pure' studies of headings. In addition, Hartley and Burnhill asked students to find material in text they had not seen before, whereas Charrow and Reddish instructed their participants to read through the passages under consideration before asking them to retrieve

information from it. Accordingly, we decided to study the effects of headings on retrieval in both ways, and not to confound the issue with other variables.

In order to measure the effectiveness of headings on retrieval it is necessary to measure how long it takes participants to find/retrieve material from the text. There seem to be a number of strategies for doing this (such as working with individuals and timing them separately, or group methods involving self-timing and/or display clocks). We decided that it was best to keep things simple in a classroom situation. We planned a situation where one of the experimenters would write a number on the blackboard, and then change this number at regular intervals (e. g. every thirty seconds). The participants in the experiment would be instructed to write down the number showing at the start of the experiment and the number showing when they had completed their search task. The numbers would be presented in random order in order to minimise cheating.

Pilot Studies

We felt it necessary to try out the viability of this approach, so we carried out two pilot studies, one using retrieval from unfamiliar text and one using retrieval from familiar text.

In order to accustom participants to the situation we devised a short practice situation. A paragraph of information on the life of Florence Nightingale was used, together with three questions. In the first pilot study twenty participants (fourth-year pupils) first read a question, found the answer to the question in the paragraph, circled it, and then did the next question. In the second

study twenty-six fourth-years first read the paragraph and then circled the answers to the questions in order. This practice paragraph was presented without headings.

After completing the practice task, the participants repeated the task with the main passage on television viewing habits - in one of the usual three conditions (text headings, marginal headings, and control). The participants were asked to record the time they started and the time they finished the task in the first pilot study, and the time they started reading, finished reading and completed the search task in the second study. In both studies the participants were asked to search for the answers to six questions.

Results of the pilot studies

The method of timing worked well and presented no difficulties. The results obtained, however, indicated no differences between the times taken to retrieve information from the passages with or without headings in either of the pilot studies.

In view of these results (which we recognised were clearly limited by the small sample size in each study) we decided to make a number of changes to our procedure. These changes were informative in that they suggest - indirectly - some of the factors that might affect the effectiveness of headings as tools to aid retrieval. The changes were as follows:

- The practice sheet was re-written. It contained a new topic (spiders), it was longer and the number of practice questions was increased from 3 to 5.

- Three versions of the practice passage were prepared - one with text headings, one with marginal headings and one without headings, and these were attached to the appropriate passages of the main experiment.
- The headings in the practice passages were written to match closely the search questions asked. Thus, e.g. a heading was 'The colour of spiders' and the question was 'What colour are spiders that get trapped in the bath?'.
- Similarly, each of the headings in the main passage was made to reflect more clearly the phraseology of the search questions. Thus, e.g., the heading 'The favourite programmes' became 'The most popular kind of programmes' for the search question 'What is the most popular kind of programme?'.
- The number of search questions for the main task was increased from 6 to 12 (i.e. we used the same questions as we had used in the recall studies).
- Finally, accuracy was stressed by example. In the practice passage one question asked how many legs had a spider? The passage reported that insects had six, but spiders had eight. Pupils who circled six were reminded that they needed to read the passage carefully in order to ensure they circled the correct information. Similarly, other practice questions demanded careful reading of the text to obtain the correct answer.

Following these changes, we then carried out the series of retrieval studies which, in this report, we shall call Experiments 3, 4, 5 and 6.

EXPERIMENT THREE

Aims

The aims of Experiment Three were (i) to see if headings written in the form of statements helped participants to find information in text they had not seen before, and (ii) to see if the position of such headings (marginal or embedded in the text) affected the readers' search times.

Materials

Practice passage. Three versions of a (one-page) practice passage containing four paragraphs on the topic of spiders (based on Whitlock, 1974) were prepared as follows:

- Headings written in the form of statements embedded in the text (approximately one per paragraph).
- Headings written in the form of statements placed in the margin.
- A control text, without headings, the same width as the text with marginal statements.

A cover sheet for the practice passage explained the procedure to be used and listed five questions which were to be used in the practice search task.

The experimental passage. Three versions of the passage on television viewing habits were again used in this experiment. In this enquiry the headings were in the form of statements and only one control passage was used (the one with the shorter line-length).

The search questions. The twelve item short-answer test used in Experiments 1 and 2 was modified for use in this experiment. Students were instructed to circle on the passage the answers to the questions.

Participants. Approximately one hundred and seventy fourth-year comprehensive school pupils (aged between 14 and 15 years) of mixed-ability from a third, different, school took part in this enquiry. They were divided by the school into three groups of ability at English - high, middle and low - and were taught in separate sets.

Procedure

Booklets containing the practice and the experimental passages were distributed systematically to the participants in each of six separate classes. The participants first did the practice task as a class exercise, i.e. they took each practice question in turn, and looked for and circled the answer on the practice passage. The need for accuracy was pointed out and explained, and so too was the requirement to 'circle just that bit of the text that gives the answer'.

After completing the practice passage, the participants were told about the need for timing the experiment, and how this was to be done. Participants were requested to complete a 'time-of-starting-box' on the front cover, and, when they had finished searching for the answers to the twelve questions, a 'time-of-finishing-box' below it. The participants were asked to signal (by raising their hand) when they had finished in order that one of the experimenters could check that they had recorded correctly the time of finishing. The order of the twelve questions for the search task was varied for each of the three conditions

to minimise cheating, and the participants were asked to search for the answer to each question in order.

Results

The data were first examined for accuracy. One hundred and forty-three pupils were one hundred percent correct. Nineteen pupils made one error, four made two errors, and three made more than two errors. With such high accuracy the results from all one hundred and sixty-nine participants were included in the analyses of the time-data. The results for the time-data are shown in Table 5.

Inspection of these data suggested that it would be legitimate to pool the results from the two headings conditions and to compare them with the control group. When this had been done a two-way analysis of variance (presence/absence of headings x sex) was carried out. The main results indicated:

- an overall conditions effect: participants in the headings conditions found the answers to the questions significantly faster ($\bar{x}$ = 13.0 minutes) than participants in the control group ($\bar{x}$ = 15.0 minutes) ($F = 7.91$, df 1,165, $p < .006$);
- no significant sex effects ($F = 1.95$, df 1,165, $p = .164$);
- no significant interactions between conditions and sex ($F = 0.867$, df 1,165, $p = .353$).

The results were next examined in terms of the ability groupings operating in the school. The means obtained are shown in Table 6.

These data were subjected to a three-way analysis of variance(ability x presence/absence of headings x sex). The results indicated:

TABLE 5. The results of Experiment 3.

Average search time in minutes to find the answers to 12 questions about unfamiliar text.

Headings in the form of statements.

		Boys	Girls	Total	Overall
Headings	Text	13.2 (N=31)	13.2 (N=26)	13.2 (N=57)	13.0 (N=111)
	Margin	13.3 (N=29)	12.3 (N=25)	12.8 (N=54)	
Control	Margin	15.8 (N=32)	14.0 (N=26)	15.0 (N=58)	15.0 (N=58)

TABLE 6. The results of Experiment 3 expressed in terms of ability.

		Boys	Girls	Total
High-ability	Headings	10.2 (N=19)	10.5 (N=23)	10.4 (N=42)
	Control	11.2 (N=11)	12.3 (N=12)	11.8 (N=23)
Middle-ability	Headings	13.1 (N=22)	13.3 (N=12)	13.2 (N=34)
	Control	15.4 (N=10)	15.0 (N=7)	15.2 (N=17)
Low-ability	Headings	16.3 (N=19)	15.5 (N=16)	15.9 (N=35)
	Control	20.8 (N=11)	15.9 (N=7)	18.9 (N=18)

- a significant ability effect: high-ability participants found information significantly faster ($\bar{x}$ = 10.9 minutes) than middle-ability ($\bar{x}$ = 13.9 minutes) and low-ability ($\bar{x}$ = 16.9 minutes) and middle-ability were significantly faster than the low-ability participants ($F = 42.84$, df 2,157, $p < .001$);
- a significant headings effect ($F = 12.96$, df 1,157, $p < .001$);
- no significant sex effect ($F = 0.745$, df 1,157, $p = .389$);
- no significant interactions.

Conclusions

The results of this experiment indicated a superiority for headings (written in the form of statements) but they did not indicate any differential effect regarding their position. High-ability participants searched faster than low-ability ones, but there were no interactions between ability and the presence/absence of headings.

To test whether these findings would be replicated with headings in the form of questions we next carried out Experiment 4.

EXPERIMENT FOUR

Aim

The aim of this experiment was to replicate Experiment Three using headings written in the form of questions instead of headings written in the form of statements.

Materials. The same as Experiment Three, except that the headings in the practice and experimental passages were written in the form of questions.

Participants. Approximately one hundred and fifteen fourth-year comprehensive school pupils as before (but from a fourth school) took part in this enquiry. There were two high-ability classes, one medium, and two (small) low-ability ones. These pupils were grouped in terms of mathematical ability, and taught in separate sets.

Procedure

The procedure was the the same as that used in Experiment Three. Participants who made more than three errors (N=5) were excluded from the analyses of time-data.

Results

The results from this enquiry are shown in Table 7. Inspection of these data suggested that it would be legitimate to pool the results from the two headings conditions and to compare them with the control group. When this had been done a two-way analysis of variance (presence/absence of headings x sex) was carried out. The main results indicated:

- an overall conditions effect : participants in the headings conditions found the answers to the questions significantly faster ($\bar{x}$ = 11.8 minutes) than participants in the control group ($\bar{x}$ = 13.4 minutes) ($F = 4.04$, df 1,99, $p < .05$);

TABLE 7. The results of Experiment 4.

Average search time in minutes to find the answers to 12 questions about unfamiliar text.

Headings in the form of questions.

		Boys	Girls	Total	Overall
Headings	Text	11.4 (N=16)	11.9 (N=19)	11.7 (N=35)	11.9 (N=69)
	Margin	12.8 (N=18)	11.0 (N=16)	12.0 (N=34)	
Control	Margin	13.2 (N=16)	13.6 (N=18)	13.4 (N=34)	13.4 (N=34)

TABLE 8. The results of Experiment 4 expressed in terms of ability.

		Boys	Girls	Total
High-ability	Headings	11.0 (N=16)	10.1 (N=21)	10.5 (N=37)
	Control	10.0 (N=7)	12.3 (N=11)	11.4 (N=18)
Low-ability	Headings	13.2 (N=18)	13.6 (N=14)	13.4 (N=32)
	Control	15.6 (N=9)	15.5 (N=7)	15.6 (N=16)

- no significant sex effect ($F = .176$, df 1,99, $p = .676$);
- no significant interaction ($F = .465$, df 1,99, $p = .497$).

The results were next examined in terms of the mathematics ability grouping data provided by the school. The results from the two high-ability classes were combined and compared with those from the three lower-ability classes. The means obtained are shown in Table 8.

These data were subjected to a three-way analysis of variance (ability x presence/absence of headings x sex). The results indicated:

- a significant ability effect : the high-ability participants found information significantly faster ($\bar{x} = 10.8$ minutes) than the low-ability participants ($\bar{x} = 14.1$ minutes) ($F = 25.521$, df 1,95, $p < .001$);
- a significant conditions effect ($F = 4.833$, df 1,95, $p < .03$);
- no significant sex effect ($F = .07$, df 1,95, $p = .792$);
- no significant interactions.

EXPERIMENT FIVE

Aims

The aims of Experiment Five were (i) to see if headings, written in the form of statements helped participants to retrieve information from a text which they had just previously read and were thus, to some extent, familiar with, and (ii) to see if the position of such headings (marginal or embedded in the text) affected the participants speed of retrieval.

Materials. The same materials that were used in Experiments Three and Four were also used in this experiment with one or two slight modifications. (See procedure.) The number of search questions for the main passages was reduced from 12 to 10 to reduce the time taken to complete the experiment.

Participants. Approximately one hundred fourth-year comprehensive school pupils as before (but from a fifth school) took part in this enquiry. There was one high-ability class, two middle-ability ones, and one of low-ability.

Procedure

Booklets containing practice and experimental passages were distributed as before. In this experiment, however, participants first read the practice passage and then found the answers for the practice questions in a class-group exercise. Following this they were then asked to read their respective experimental passages for a period of six minutes. They were informed after four minutes had elapsed that two minutes remained, and they were instructed that, if they finished in the time available, they should look over their passage.

When the reading period was completed, it was explained to the participants how searching for answers to the questions would be timed. The participants were asked to complete a 'time-of-starting-box' (at the top of the search list) and to complete a 'time-of-finishing-box' (at the bottom) when they had completed the task. They were asked to signal (by raising their hands) when they had finished so that one of the experimenters could check that they had done everything correctly. Again the

participants were asked to search for the answers to the questions in order. These instructions took approximately three minutes to give, so that there was this period of delay between reading the text and searching it in order to find the answers to the questions. In this experiment the numbers on the blackboard were changed every twenty seconds (instead of every thirty seconds as in the previous experiments).

Again, participants who made more than three errors (N=2) were excluded from the analyses of the time-data.

Results

The experimental results are summarised in Table 9. As in previous studies inspection of this table suggests that it would be legitimate to pool the data for the two headings conditions and to compare them with the control group. A two-way analysis of variance (presence/absence of headings x sex) was employed. The results indicated:

- an overall conditions effect : participants in the headings groups retrieved the answers to the questions significantly faster ($\bar{x}$ = 8.0 minutes) than those in the control group ($\bar{x}$ = 10.2 minutes). $F = 14.2$, df 1,96, $p < .001$;
- no significant sex effect ($F = 0.00$, df 1,96, $p = .998$);
- no significant interaction ($F = 0.462$, df 1,96, $p = .492$).

The results were next examined in terms of the school-based ability groupings. As noted above there was one high-ability class, two middle-ability ones, and one low-ability one. The means obtained are shown in Table 10.

The data were subjected to a three-way analysis of variance (ability x presence/absence of headings x sex). The results showed:

- a significant ability effect ($F = 31.4$, df 2,88, $p < .001$): the high-ability participants ($\bar{x} = 7.3$ minutes) and the middle-ability participants ($\bar{x} = 8.2$ minutes) both retrieved information significantly faster than the low-ability ones ($\bar{x} = 12.0$ minutes) (Scheffé test $p < .01$);
- a significant conditions effect ($F = 25.2$, df 1,88, $p < .001$);
- no significant sex effect ($F = 0.34$, df 1,88, $p = .561$);
- a significant sex x ability interaction ($F = 5.49$, df 2,88, $p < .006$) (a consequence of the poorer performance of the low-ability girls);
- no other significant interactions between these variables.

TABLE 9. The results of Experiment 5.

Average retrieval time in minutes to find the answers to 10 questions about familiar text.

Headings in the form of statements.

		Boys	Girls	Total	Overall
Headings	Text	8.1 (N=19)	8.1 (N=14)	8.1 (N=33)	8.0 (N=67)
	Margin	8.0 (N=20)	7.4 (N=14)	7.8 (N=34)	
Control	Margin	9.9 (N=19)	10.5 (N=14)	10.2 (N=33)	10.2 (N=33)

TABLE 10. The results of Experiment 5 expressed in terms of ability.

		Boys	Girls	Total
High-ability	Headings	7.4 (N=10)	5.8 (N=10)	6.6 (N=20)
	Control	8.3 (N=4)	9.3 (N=5)	8.9 (N=9)
Middle-ability	Headings	7.5 (N=21)	7.5 (N=13)	7.5 (N=34)
	Control	9.5 (N=11)	9.2 (N=7)	9.4 (N=18)
Low-ability	Headings	10.0 (N=8)	12.3 (N=5)	10.9 (N=13)
	Control	12.6 (N=4)	18.0 (N=2)	14.4 (N=6)

EXPERIMENT SIX

Aim

The aim of this experiment was to replicate Experiment Five using headings written in the form of questions instead of headings written in the form of statements.

Materials. The same as Experiment Five, except that the headings in the practice and the experimental passages were written in the form of questions.

Participants. Approximately one hundred and fifteen fourth-year comprehensive school pupils as before (but from a sixth school) took part in this enquiry. There were two high-ability English classes, one medium-ability, and two low-ability ones.

Procedure

The procedure was the same as that used in Experiment Five except that the high-ability pupils were given five minutes to read the passage, the medium-ability six minutes, and the low-ability seven minutes. Participants who made more than three errors in finding the answers to the questions (N=6) were excluded from the analyses of the time-data.

The results obtained are summarised in Table 11. As before, inspection of these data suggested that it would be legitimate to pool the data for the two headings conditions and to compare them

with the control group. A two-way analysis of variance (presence/absence of headings x sex) was employed. The results showed:

- an overall conditions effect : participants in the headings groups retrieved the answers to the questions significantly faster ($\bar{x}$ = 7.5 minutes) than those in the control group ($\bar{x}$ = 8.9 minutes). ($F = 6.11$, df 1,99, $p < .015$);
- no significant sex effect ($F = 0.13$, df 1,99, $p = .717$);
- no significant interactions ($F = 0.21$, df 1,99, $p = .646$).

The data were next examined in terms of the ability groupings used by the school. The results from the two higher-ability classes were combined and compared with those obtained from the three lower-ability ones. The means obtained are shown in Table 12.

These data were subjected to a three-way analysis of variance (ability x presence/absence of headings x sex). These results indicated:

- a significant conditions effect ($F = 8.93$, df 1,95, $p < .004$);
- a significant ability effect : higher-ability participants retrieved information more quickly ($\bar{x}$ = 6.3 minutes) than lower-ability ones ($\bar{x}$ = 9.1 minutes). ($F = 34.53$, df 1,95, $p < .001$);
- no significant sex effect ($F = 0.12$, df 1,95, $p = .724$);
- no significant interactions between these variables.

TABLE 11. The results of Experiment 6.

Average retrieval time in minutes to find the answers to 10 questions about familiar text.

Headings in the form of questions.

		Boys	Girls	Total	Overall
Headings	Text	8.1 (N=12)	7.2 (N=21)	7.5 (N=33)	7.5 (N=69)
	Margin	7.3 (N=13)	7.4 (N=23)	7.4 (N=36)	
Controls	Margin	8.8 (N=15)	9.0 (N=19)	8.9 (N=34)	8.9 (N=34)

TABLE 12. The results of Experiment 6 expressed in terms of ability.

		Boys	Girls	Total
High-ability	Headings	6.3 (N=11)	5.9 (N=20)	6.0 (N=31)
	Controls	7.7 (N=7)	6.5 (N=9)	7.0 (N=16)
Low-ability	Headings	8.7 (N=14)	8.4 (N=24)	8.5 (N=38)
	Controls	9.7 (N=8)	11.2 (N=10)	10.5 (N=18)

SUMMARY AND DISCUSSION

The results from the first six experiments are clearcut. In these experiments headings have helped both the recall of information, and the retrieval of information (from familiar and unfamiliar text). These results have been found whether or not the headings were written in the form of statements or questions, and whether or not the headings were embedded in the text or placed in the margin. And, in four of the experiments, headings have helped less-able children more. The size of the effects for headings is shown in Tables 13 and 14.

It is clearly premature to discuss in full the results described in this report, as our series of experiments is not yet complete, and we wish to replicate and extend our findings with other texts, and different age and ability groups. And, of course, it is too early to generalise from these findings to stating how one might design different kinds of instructional text. We have not yet examined, for example, different ways of denoting typographically headings embedded in text, and/or headings which convey different levels of text structure (see Twyman, 1981).

Nonetheless, a few pertinent remarks might be made here. It will not have escaped the readers' attention that our approach is a-theoretical. We are not driven by any particular notions about text structure, nor by any strong views about mathemagenics or cognitive psychology. Nonetheless, we do have some views on why we have found the results that we have, and our findings certainly have implications for psychologists more theoretical than ourselves.

We think headings work because:

- they help readers appreciate the structure and organisation of the text;
- they help readers bridge the gap between paragraph comprehension and text comprehension (Calfee, 1981);
- they make the intentions of the writer clearer to the readers;
- they help readers to see how the text fits in with their own prior knowledge or schemata - about both the content of the text and how the text is likely to be structured;
- they help as retrieval cues when it comes to recall. (Holley et al, 1981).

We think that headings guide reader-text interactions and particularly that they help less-able readers to envisage more easily schemata which are relevant to the task. We think that this may especially be the case with headings written in the form of questions. Adjunct questions need not necessarily aid recall, but it is likely that headings in the form of questions will provide a clearer guidance to readers about the author's purpose. Others have indicated that headings in the form of questions are useful if readers themselves approach the text with questions in mind (e.g. see Flower et al, 1980, and Anon, 1981).

One implication of this view is that we would expect headings to be effective for recall when the material to be learned is not totally unfamiliar to the reader, or not totally irrelevant. In our experiments our readers are all familiar with the contents of the passage - they know all about different television channels, different programs and they know their own likes and dislikes. Consequently the content makes sense to them: all the passage does is to organise this material,

Experiment 1.	Recall score Headings as statements	11.2
Experiment 2.	Recall score Headings as questions	12.1
Experiment 3.	Search time Headings as statements	15.5
Experiment 4.	Search time Headings as questions	13.1
Experiment 5.	Retrieval time Headings as statements	27.5
Experiment 6.	Retrieval time Headings as questions	19.5

TABLE 14. The percentage gain for headings in the different ability groups.

Experiment 1.	High-ability	11.5
	Middle-ability	10.7
	Low-ability	10.6
Experiment 2.	High-ability	1.5
	Middle-ability	5.2
	Low-ability	32.6
Experiment 3.	High-ability	13.5
	Middle-ability	15.2
	Low-ability	18.9
Experiment 4.	High-ability	8.6
	Low-ability	16.4
Experiment 5.	High-ability	34.8
	Middle-ability	25.3
	Low-ability	32.1
Experiment 6.	High-ability	16.7
	Low-ability	23.5

and to give it some concrete realisation. We would suggest that investigators who use materials whose contents are totally unfamiliar to their readers, or totally irrelevant (e.g. Cole, 1977) would not find headings to be very effective. (Cole did not.) Unfortunately, however, it has proved difficult, if not impossible, to support this prediction from the research summarised in Panel 1.

Acknowledgements

We are indebted to pupils and staff in the following schools for their generous assistance:

The Regis School, Tettenhall, Wolverhampton.

Clough Hall Comprehensive School, Kidsgrove, Stoke-on-Trent.

Maryhill Comprehensive School, Kidsgrove, Stoke-on-Trent.

Alsager Comprehensive School, Alsager.

Marshlands High School, Newcastle-under-Lyme.

The Edward Orme School, Newcastle-under-Lyme.

The research reported in this paper has been made possible by Contract No. DAJA37-81-C-0277 from the U.S. Army Research Institute for the Behavioral and Social Sciences through its European Liaison Office at the European Research Office of the U.S. Army, London, England. The opinions expressed are those of the authors and do not necessarily represent those of the U.S. Army.

References

Anon Treating the whole document : a benefits handbook. Simply Stated, 1981, No. 21, 1-3. Journal of the Document Design Project, 1055 Thomas Jefferson Street N.W., Washington DC 20007.

Brooks, L.W., Dansereau, D., Spurlin, J.E., & Holley, C.D. Instructing students on the use of headings as aids in processing scientific text. Paper presented to the AERA Convention, Los Angeles, April, 1981. Paper available from the authors, Texas Christian University, U.S.A.

Calfee, R. Cognitive psychology and educational practice. In D.C. Berliner (Ed) Review of Research in Education, Vol. 9. Washington: American Educational Research Association, 1981.

Charrow, V.R. & Reddish, J.C. A study of standardised headings for warranties. Technical Report No. 6, Document Design Project, 1055 Thomas Jefferson Street, N.W., Washington DC 20007, 1980.

Christensen, C.M. & Stordahl, K.E. The effects of organisational aids on comprehension and retention. Journal of Educational Psychology, 1955, 46, 65-74.

Cole, J.N. The effects of non-prose textual characteristics on retention of major concepts and supporting details with and without specific instruction in their use. In P.D. Pearson and J. Hansen (Eds) Reading: Theory, Research and Practice (26th Yearbook of the National Reading Conference) Carolina: Clemson, 1977.

Dee-Lucas, D. & DiVesta, F.J. Learner-generated organisational aids : effects on learning from text. Journal of Educational Psychology, 1980, 72, 304-311.

Doctorow, M., Wittrock, M.C. & Marks, C. Generative processes in reading comprehension. Journal of Educational Psychology, 1978, 70, 109-118.

Flower, L.S., Hayes, J.R. & Swarts, H. Revising functional documents: the scenario principle. Technical Report No. 10, Document Design Project, Carnegie-Mellon University, Pittsburgh, 1980.

Hartley, J. & Burnhill, P. Explorations in space : a critique of the typography of BPS publications. Bulletin of the British Psychological Society, 1976, 29, 97-107.

Hartley, J., Kenely,J., Owen, G. & Trueman, M. The effects of headings on children's recall from prose text. British Journal of Educational Psychology, 1980, 50, 304-307.

Hartley, J., Morris, P. & Trueman, M. Headings in text. Remedial Education, 1981, 16, 5-7.

Holley, C.D., Dansereau, D.F., Evans, S.H., Collins, K.W., Brooks, L. & Larson, D. Utilizing intact and embedded headings as processing aids with non-narrative text. Contemporary Educational Psychology, 1981, 6, 227-236.

Klare, G.R., Shuford, E.H. & Nichols, W.H. The relation of format organisation to learning. Educational Research Bulletin, 1958, 37, 39-45.

Robinson, F.P. & Hall, P. Studies of higher-level reading abilities. Journal of Educational Psychology, 1941, 32, 241-252.

Twyman, M. Typography without words. Visible Language, 1981, XVI, 5-12.

Whitlock. R. Spiders. London: Priory Press, 1974.